Bergen County Mathematics League

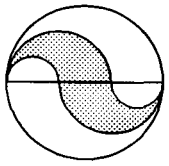
Good Luck To You

Good Luck To All

Contest #3 (No Calculators) **2011-2012**

Part I *Time Limit: 12 minutes* On contests #4 and #6, ***any S.A.T. calculator will be allowed.***

3-1. In a circle whose diameter is 12, semicircles are drawn on the trisection points of the circle's diameter, as shown. These four semicircles partition the interior of the circle into three regions. What is the area of the shaded region?

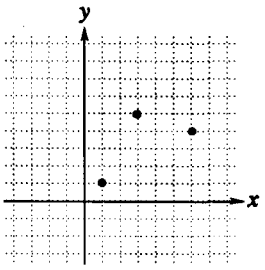


3-2. If a, b, and c are real numbers for which $a+b+c = 12$ and $a^2+b^2+c^2 = 50$, what is the value of $(a+1)^2+(b+1)^2+(c+1)^2$?

Part II *Time Limit: 12 minutes*

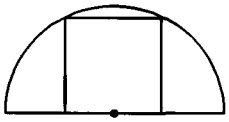
3-3. What positive integer m satisfies $\left(\frac{m}{3}\right) = \frac{m}{3}$?

3-4. What are all ordered pairs (x,y) in the rectangular coordinate plane for which the four vertices of a parallelogram could be (1,1), (3,5), (6,4), and (x,y), not necessarily in that order?



Part III *Time Limit: 12 minutes*

3-5. A square of area 4 is inscribed in a semicircle as shown, with one side on the semicircle's diameter and two vertices on the semicircle. What is the area of the semicircle?



3-6. For which positive integer n in radians, $1 \leq n \leq 5$, does $\cos n$ have its least value?

***Notice*: A question next meet will repeat the theme of question 3-1.**

Answers

3-1. 12π

3-2. 77

3-3. 3

3-4. (−2,2), (4,0), (8,8) All three required

3-5. $\frac{5\pi}{2}$

3-6. 3